

What is claimed is:

1. A resist composition comprising:

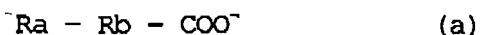
(A) a compound capable of generating an active seed upon irradiation with one of an actinic ray and a radiation,

(B) a compound capable of reacting with the active seed generated from the compound (A) and/or performing electron transfer to generate an active seed different from the active seed generated from the compound (A), and

(C) a compound capable of performing electron transfer from the active seed generated from the compound (B) to generate an acid,

wherein supposing that the 1/2 wave of the oxidation potential of the active seed generated from the compound (B) is E_{pa} and the 1/2 wave of the reduction potential of the active seed generated from the compound (C) is E_{pc} , the relationship: $E_{pc} - E_{pa} > 0$ is satisfied.

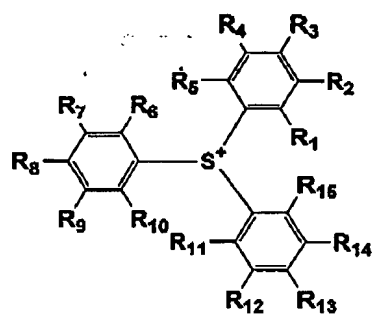
2. The resist composition according to claim 1, wherein the compound (A) contains a structure represented by the following formula (a):



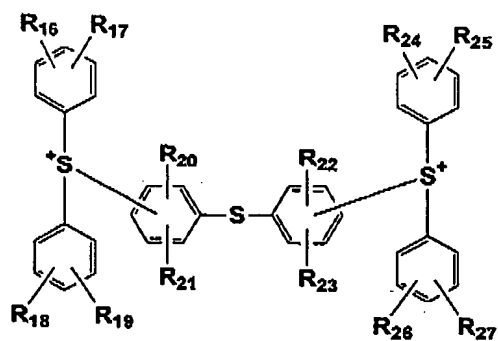
wherein Ra represents a hydrogen atom, a substituted or unsubstituted C_6-C_{16} aryl group, a substituted or unsubstituted C_1-C_{20} straight-chain, branched or cyclic alkyl group, $-COO^-$ or $-SO_3^-$, and

Rb represents a single bond, $-C(=O)-$, $-NH-$ or $-S(=O)_2-$.

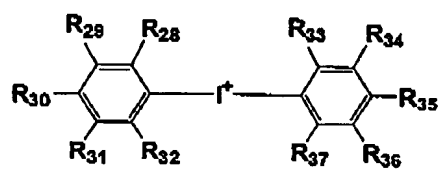
3. The resist composition according to claim 1, wherein the compound (A) is at least one selected from the group consisting of compounds represented by the formulae (a) and (I) to (IV) in combination:



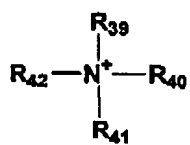
(I)



(II)



(III)

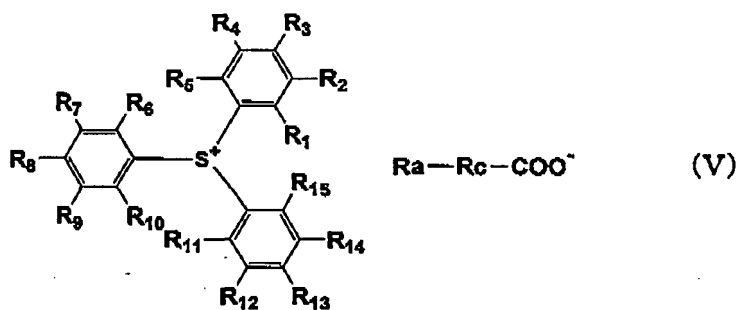


(IV)

wherein R_1 to R_3 , each independently represents a hydrogen atom, a straight-chain, branched or cyclic alkyl or alkoxy group, a hydroxyl group, a halogen atom or $-S-R_{38}$ in which R_{38} represents a straight-chain, branched or cyclic alkyl or aryl group, with the proviso that two or more of R_1 to R_{15} , R_{16} to R_{27} and R_{28} to R_{37} may be bonded to each other to form a ring containing one or more selected from the group consisting of a single bond, a carbon atom, an oxygen atom, a sulfur atom and a nitrogen atom, and

R_{39} to R_{42} each independently represents a hydrogen atom or a straight-chain, branched or cyclic alkyl or aryl group.

4. The resist composition according to claim 1, wherein the compound (A) is represented by the following formula (V):



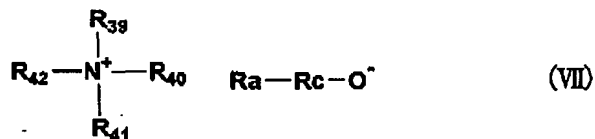
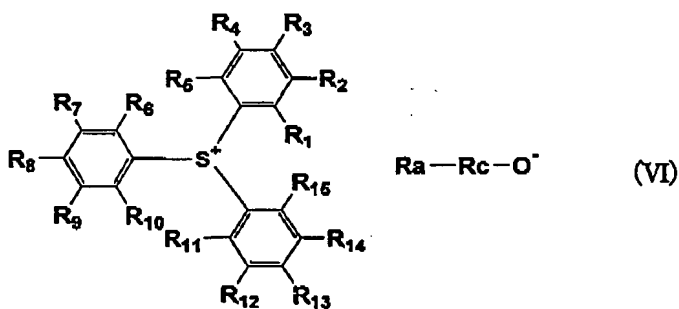
wherein R_a represents a hydrogen atom, a substituted or unsubstituted C_6-C_{16} aryl group, a substituted or unsubstituted C_1-C_{20} straight-chain, branched or cyclic alkyl group, $-\text{COO}^-$ or $-\text{SO}_3^-$,

R_c represents CH_2 , $\text{CH}R_a$ or $\text{C}(R_a)_2$,

R_1 to R_{15} each independently represents a hydrogen atom, a

straight-chain, branched or cyclic alkyl or alkoxy group, a hydroxyl group, a halogen atom or $-S-R_{38}$ in which R_{38} represents a straight-chain, branched or cyclic alkyl or aryl group, with the proviso that two or more of R_1 to R_{15} may be bonded to each other to form a ring containing one or more selected from the group consisting of a single bond, a carbon atom, an oxygen atom, a sulfur atom and a nitrogen atom.

5. The resist composition according to claim 1, wherein the compound (A) is represented by the following formula (VI) or (VII):



wherein R_a represents a hydrogen atom, a substituted or unsubstituted C_6-C_{16} aryl group, a substituted or unsubstituted C_1-C_{20} straight-chain, branched or cyclic alkyl group, $-COO^-$ or $-SO_3^-$,

R_c represents CH_2 , CHR_a or $C(R_a)_2$,

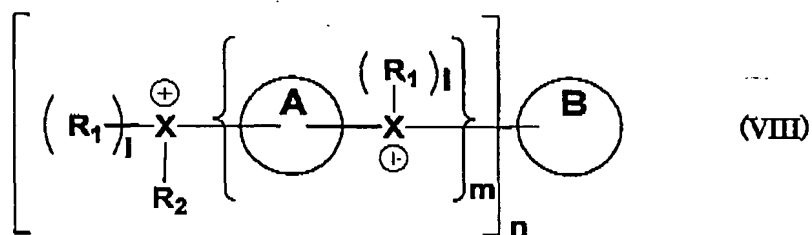
R_1 to R_{15} each independently represents a hydrogen atom, a

straight-chain, branched or cyclic alkyl or alkoxy group, a hydroxyl group, a halogen atom or $-S-R_{38}$ in which R_{38} represents a straight-chain, branched or cyclic alkyl or aryl group, with the proviso that two or more of R_1 to R_{15} may be bonded to each other to form a ring containing one or more selected from the group consisting of a single bond, a carbon atom, an oxygen atom, a sulfur atom and a nitrogen atom, and

R_{39} to R_{42} each independently represents a hydrogen atom or a straight-chain, branched or cyclic alkyl or aryl group.

6. The resist composition according to claim 1, wherein E_{pc} of the compound (C) is higher than -1.15 V.

7. The resist composition according to claim 1, wherein the compound (C) is a compound having a partial structure represented by the following formula (VIII) and a counter ion capable of generating an acid upon irradiation with one of an actinic ray and a radiation:



wherein X represents a sulfur atom or an iodine atom, with the proviso that the plurality of X's may be the same or different,

R₁ and R₂ each independently represents an alkyl or an aryl group, with the proviso that the plurality of R₁'s, if any, may be the same or different, the plurality of R₂'s, if any, may be the same or different, and R₁ and R₂, R₁ and A, R₁ and B, R₂ and A, and R₂ and B may be bonded to each other to form a ring,

A and B each independently represents a hydrocarbon structure connecting between X's, with the proviso that at least one of connections of X's with A or B indicates a structure in which X's connected are in the same conjugation and the plurality of A's, if any, may be the same or different,

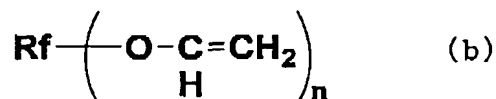
l represents 0 or 1, with the proviso that when X is a sulfur atom, the number l of R¹'s connected to X⁺ represents 1, and when X is an iodine atom, the number l of R¹'s connected to X⁺ represents 0,

m represents an integer of from 0 to 10,

n represents an integer of from 1 to 6, with the proviso that when m is 0, n represents an integer of not smaller than 2.

8. The resist composition according to claim 1, wherein the compound (B) is a phenol derivative containing from 1 to 10 benzene ring atomic groups per molecule and having at least one hydroxymethyl group and at least one alkoxymethyl group per molecule.

9. The resist composition according to claim 1, wherein the compound (B) contains a structure represented by the following formula (b):



wherein Rf represents a substituted or unsubstituted aryl group, a substituted or unsubstituted straight-chain, branched or alicyclic hydrocarbon group or a combination thereof, which may have a carbonyl group, an oxygen atom or a sulfur atom in the middle portion thereof, and n represents an integer of from 1 to 10.

10. The resist composition according to claim 1, wherein the compound (B) is a cyclic ether compound.

11. The resist composition according to claim 1, further comprising (E) a nitrogen-containing basic compound.

12. The resist composition according to claim 1, wherein the actinic ray or radiation is selected from the group consisting of electron ray, X ray and EUV ray.

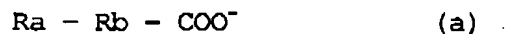
13. A negative-working resist composition comprising:

(A) at least one selected from the group consisting of compounds represented by the formulae (a) and (I) to (IV) in combination,

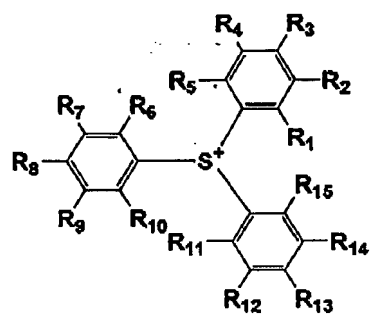
(B) a crosslinking agent capable of carrying out addition reaction with the alkali-soluble resin which is the component (D1) by the action of an acid,

(C) a compound having a partial structure represented by the following formula (VIII) and a counter ion capable of generating an acid upon irradiation with one of an actinic ray and a radiation, and

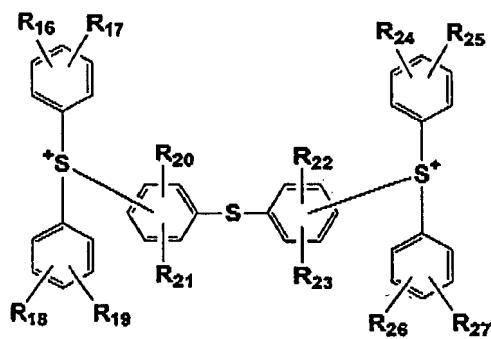
(D1) an alkali-soluble resin:



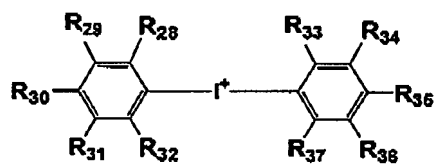
wherein Ra represents a hydrogen atom, a substituted or unsubstituted $\text{C}_6\text{-C}_{16}$ aryl group, a substituted or unsubstituted $\text{C}_1\text{-C}_{20}$ straight-chain, branched or cyclic alkyl group, -COO^- or -SO_3^- , and Rb represents a single bond, -C(=O)- , -NH- or $\text{-S(=O)}_2\text{-}$:



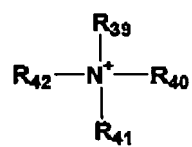
(I)



(II)



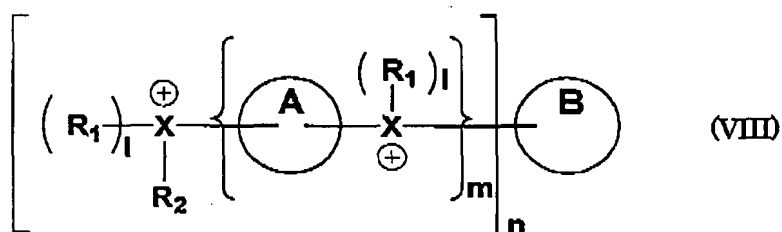
(III)



(IV)

wherein R_1 to R_{37} each independently represents a hydrogen atom, a straight-chain, branched or cyclic alkyl or alkoxy group, a hydroxyl group, a halogen atom or $-S-R_{38}$ in which R_{38} represents a straight-chain, branched or cyclic alkyl or aryl group, with the proviso that two or more of R_1 to R_{15} , R_{16} to R_{27} and R_{28} to R_{37} may be bonded to each other to form a ring containing one or more selected from the group consisting of a single bond, a carbon atom, an oxygen atom, a sulfur atom and a nitrogen atom, and

R_{39} to R_{42} each independently represents a hydrogen atom or a straight-chain, branched or cyclic alkyl or aryl group:



wherein X represents a sulfur atom or an iodine atom, with the proviso that the plurality of X's may be the same or different,

R_1 and R_2 each independently represents an alkyl or an aryl group, with the proviso that the plurality of R_1 's, if any, may be the same or different, the plurality of R_2 's, if any, may be the same or different, and R_1 and R_2 , R_1 and A, R_1 and B, R_2 and A, and R_2 and B may be bonded to each other to form a ring,

A and B each independently represents a hydrocarbon structure connecting between X⁺'s, with the proviso that at least one of connections of X⁺'s with A or B indicates a structure in which X⁺'s connected are in the same conjugation and the plurality of A's, if any, may be the same or different,

l represents 0 or 1, with the proviso that when X is a sulfur atom, the number l of R¹'s connected to X⁺ represents 1, and when X is an iodine atom, the number l of R¹'s connected to X⁺ represents 0,

m represents an integer of from 0 to 10,

n represents an integer of from 1 to 6, with the proviso that when m is 0, n represents an integer of not smaller than 2.

14. A negative-working resist composition comprising:

(A) at least one selected from the group consisting of compounds represented by the formulae (a') and (I) to (IV) in combination,

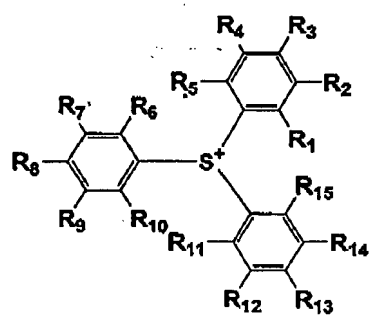
(B) a crosslinking agent capable of carrying out addition reaction with the alkali-soluble resin which is the component (D1) by the action of an acid, and

(C) a compound having a partial structure represented by the following formula (VIII) and a counter ion capable of generating an acid upon irradiation with one of an actinic ray and a radiation,

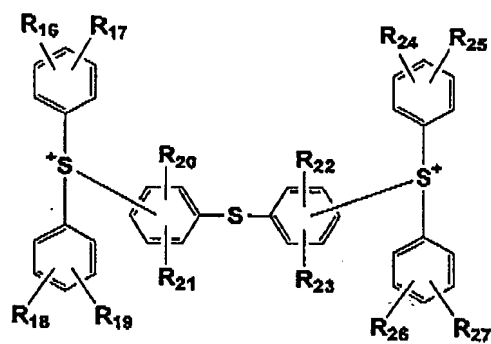
(D1) an alkali-soluble resin:

$Ra - O^-$ (a')

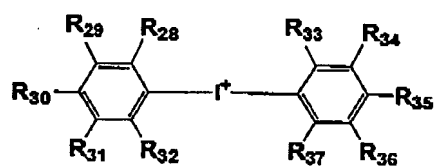
wherein Ra represents a hydrogen atom, a substituted or unsubstituted C_6-C_{16} aryl group, a substituted or unsubstituted C_1-C_{20} straight-chain, branched or cyclic alkyl group, $-COO^-$ or $-SO_3^-$:



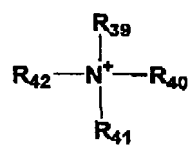
(I)



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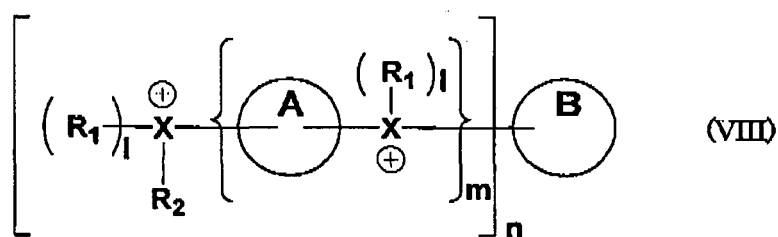
(III)



(IV)

wherein R_1 to R_{37} each independently represents a hydrogen atom, a straight-chain, branched or cyclic alkyl or alkoxy group, a hydroxyl group, a halogen atom or $-S-R_{38}$ in which R_{38} represents a straight-chain, branched or cyclic alkyl or aryl group, with the proviso that two or more of R_1 to R_{15} , R_{16} to R_{27} and R_{28} to R_{37} may be bonded to each other to form a ring containing one or more selected from the group consisting of a single bond, a carbon atom, an oxygen atom, a sulfur atom and a nitrogen atom, and

R_{39} to R_{42} each independently represents a hydrogen atom or a straight-chain, branched or cyclic alkyl or aryl group:



wherein X represents a sulfur atom or an iodine atom, with the proviso that the plurality of X's may be the same or different,

R_1 and R_2 each independently represents an alkyl or an aryl group, with the proviso that the plurality of R_1 's, if any, may be the same or different, the plurality of R_2 's, if any, may be the same or different, and R_1 and R_2 , R_1 and A, R_1 and B, R_2 and A, and R_2 and B may be bonded to each other to form a ring,

A and B each independently represents a hydrocarbon structure connecting between X⁺'s, with the proviso that at least one of connections of X⁺'s with A or B indicates a structure in which X⁺'s connected are in the same conjugation and the plurality of A's, if any, may be the same or different,

l represents 0 or 1, with the proviso that when X is a sulfur atom, the number l of R¹'s connected to X⁺ represents 1, and when X is an iodine atom, the number l of R¹'s connected to X⁺ represents 0,

m represents an integer of from 0 to 10,

n represents an integer of from 1 to 6, with the proviso that when m is 0, n represents an integer of not smaller than 2.

15. The negative-working resist composition according to claim 13, wherein the component (A) is at least one selected from the compounds represented by the formula (a) and the formula (I) or (II) in combination.

16. The positive-working resist composition according to claim 13, further comprising (E) a nitrogen-containing basic compound.

17. A positive-working resist composition comprising:

(A) at least one selected from the group consisting of compounds represented by the formulae (a) and (I) to (IV) in combination,

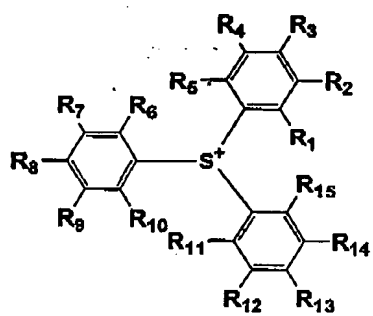
(C) a compound having a partial structure represented by the

following formula (VIII) and a counter ion capable of generating an acid upon irradiation with one of an actinic ray and a radiation, and

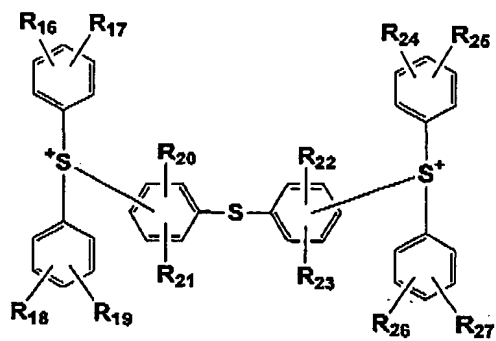
(D2) a resin increasing the solubility in an alkali developer by the action of an acid:



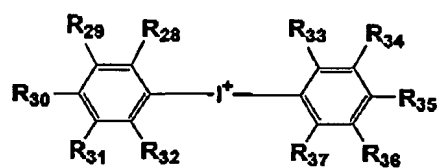
wherein Ra represents a hydrogen atom, a substituted or unsubstituted $\text{C}_6\text{-C}_{16}$ aryl group, a substituted or unsubstituted $\text{C}_1\text{-C}_{20}$ straight-chain, branched or cyclic alkyl group, -COO^- or -SO_3^- , and Rb represents a single bond, -C(=O)- , -NH- or $\text{-S(=O)}_2\text{-}$:



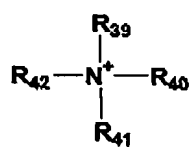
(I)



(II)



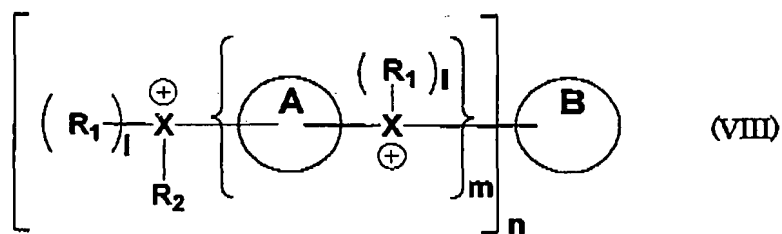
(III)



(IV)

wherein R_1 to R_{37} each independently represents a hydrogen atom, a straight-chain, branched or cyclic alkyl or alkoxy group, a hydroxyl group, a halogen atom or $-S-R_{38}$ in which R_{38} represents a straight-chain, branched or cyclic alkyl or aryl group, with the proviso that two or more of R_1 to R_{15} , R_{16} to R_{27} and R_{28} to R_{37} may be bonded to each other to form a ring containing one or more selected from the group consisting of a single bond, a carbon atom, an oxygen atom, a sulfur atom and a nitrogen atom, and

R_{39} to R_{42} each independently represents a hydrogen atom or a straight-chain, branched or cyclic alkyl or aryl group:



wherein X represents a sulfur atom or an iodine atom, with the proviso that the plurality of X's may be the same or different,

R_1 and R_2 each independently represents an alkyl or an aryl group, with the proviso that the plurality of R_1 's, if any, may be the same or different, the plurality of R_2 's, if any, may be the same or different, and R_1 and R_2 , R_1 and A, R_1 and B, R_2 and A, and R_2 and B may be bonded to each other to form a ring,

A and B each independently represents a hydrocarbon structure connecting between X⁺'s, with the proviso that at least one of connections of X⁺'s with A or B indicates a structure in which X⁺'s connected are in the same conjugation and the plurality of A's, if any, may be the same or different,

l represents 0 or 1, with the proviso that when X is a sulfur atom, the number l of R¹'s connected to X⁺ represents 1, and when X is an iodine atom, the number l of R¹'s connected to X⁺ represents 0,

m represents an integer of from 0 to 10,

n represents an integer of from 1 to 6, with the proviso that when m is 0, n represents an integer of not smaller than 2.

18. A positive-working resist composition comprising:

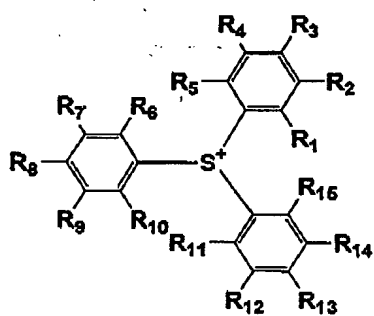
(A) at least one selected from the group consisting of compounds represented by the formulae (a') and (I) to (IV) in combination,

(C) a compound having a partial structure represented by the following formula (VIII) and a counter ion capable of generating an acid upon irradiation with one of an actinic ray and a radiation, and

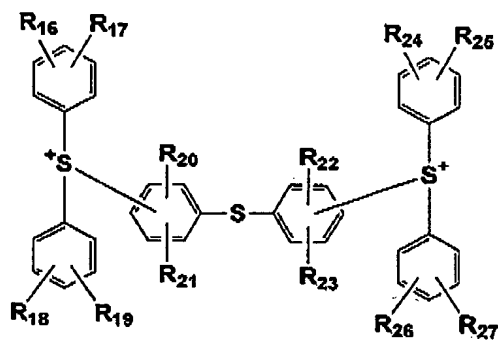
(D2) a resin increasing the solubility in an alkali developer by the action of an acid:

$Ra - O^-$ (a')

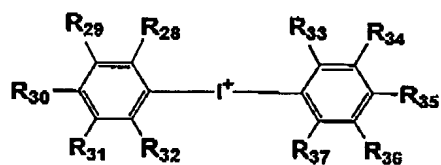
wherein Ra represents a hydrogen atom, a substituted or unsubstituted C_6-C_{16} aryl group, a substituted or unsubstituted C_1-C_{20} straight-chain, branched or cyclic alkyl group, $-COO^-$ or $-SO_3^-$:



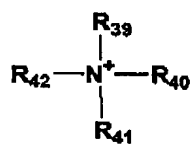
(I)



(II)



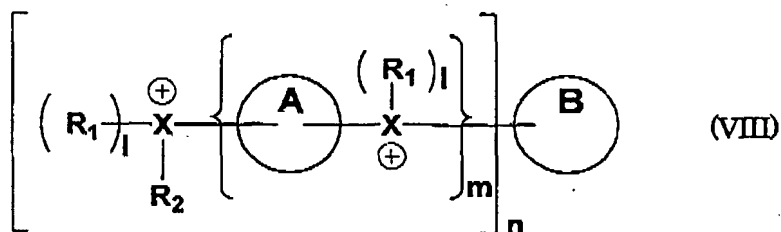
(III)



(IV)

wherein R_1 to R_{37} each independently represents a hydrogen atom, a straight-chain, branched or cyclic alkyl or alkoxy group, a hydroxyl group, a halogen atom or $-S-R_{38}$ in which R_{38} represents a straight-chain, branched or cyclic alkyl or aryl group, with the proviso that two or more of R_1 to R_{15} , R_{16} to R_{27} and R_{28} to R_{37} may be bonded to each other to form a ring containing one or more selected from the group consisting of a single bond, a carbon atom, an oxygen atom, a sulfur atom and a nitrogen atom, and

R_{39} to R_{42} each independently represents a hydrogen atom or a straight-chain, branched or cyclic alkyl or aryl group:



wherein X represents a sulfur atom or an iodine atom, with the proviso that the plurality of X's may be the same or different,

R_1 and R_2 each independently represents an alkyl or an aryl group, with the proviso that the plurality of R_1 's, if any, may be the same or different, the plurality of R_2 's, if any, may be the same or different, and R_1 and R_2 , R_1 and A, R_1 and B, R_2 and A, and R_2 and B may be bonded to each other to form a ring,

A and B each independently represents a hydrocarbon structure connecting between X⁺'s, with the proviso that at least one of connections of X⁺'s with A or B indicates a structure in which X⁺'s connected are in the same conjugation and the plurality of A's, if any, may be the same or different,

l represents 0 or 1, with the proviso that when X is a sulfur atom, the number l of R¹'s connected to X⁺ represents 1, and when X is an iodine atom, the number l of R¹'s connected to X⁺ represents 0,

m represents an integer of from 0 to 10,

n represents an integer of from 1 to 6, with the proviso that when m is 0, n represents an integer of not smaller than 2.

19. The positive-working resist composition according to claim 17, wherein the component (A) is at least one selected from the compounds represented by the formula (a) and the formula (I) or (II) in combination.

20. The positive-working resist composition according to claim 17, further comprising (E) a nitrogen-containing basic compound.

21. The resist composition according to claim 13, wherein the actinic ray or radiation is selected from the group consisting of electron ray, X ray and EUV ray.